The facilities for the moral treatment of the patients at Bethlem have been increased, and a regular system of labour is so far introduced that about *two-thirds* of the patients are constantly employed.

"Personal restraint," says the report, "has been reduced to one-tenth of what it was six years ago; and it is most gratifying to be able to state, that it has been reduced during this year to one-half of what it was in 1843."

"It is almost unnecessary to say that restraint has diminished just as the means of occupation and amusement have been increased, and that without such means and appliances it would be injudicious to attempt to dispense with mechanical restraint."

In the diminution of restraining apparatus to the minimum required by true philanthropy; in the establishment of a system of regular manual labour; and last, though perhaps least, in the publication of an elaborate report in a style indicative of the perfection of art, the government of Bethlem hospital has set an example which, it is to be hoped, will be followed by those concerned in the management of other kindred institutions. P. E.

ART. XVI.—*Vital Chemistry.—Lectures on Animal Heat.* By THOMAS SPENCER, M. D., Professor of the Institutes and Practice of Medicine in the Medical Institute of Geneva College. 12mo., pp. 114. Geneva, 1845.

SINCE the attention of physiologists has been directed to the subject of vital chemistry, and its agency in the production of the phenomena of organic life, by the promulgation of the ingenious, and from their simplicity and apparent truthfulness, very captivating theories of Liebig, we have been presented with several publications, in which attempts are made to explain, upon purely chemical principles, the functions of digestion, chylosis, hæmatosis, and nutrition.

The examination of the laws and products of vital chemistry is unquestionably calculated to lead to very important results, provided it be conducted in a right spirit, and with a constant recollection that the changes, whether of composition or decomposition, which take place in the living organism, although governed by strictly chemical laws, are nevertheless under the control of life, in whatever we may suppose this latter to consist; and that, although chemical changes act a very important part in the production of the organic phenomena, they are not the sole cause of these phenomena, and are, to a very great degree, directed and controled by the vitality of the organism; and hence, that the laws and results of vital chemistry are to be studied, not in the laboratory, but in the living body alone.

The work of Dr. Spencer, the object of which is to investigate the vital chemistry of respiration and hæmatosis generally, with a view to determine the source of animal heat, is one deserving of a close study. His manner of investigating the subject is perfectly logical, so that, admitting the accuracy of his premises, most of his conclusions necessarily follow. We have only to regret that he has been urged into a somewhat hasty publication of his views; that he has not taken time to elaborate them more fully, to fortify, with more numerous facts and illustrations, his several positions, and to fill up and complete the mere sketch which he has now presented. He would, in this manner, have done greater justice to himself, and succeeded more fully in convincing his readers of the truth of his views.

To give a general idea of Dr. Spencer's theory of animal heat, we present his conclusions, as drawn up by himself.

"The following summary may be presented of the reciprocal chemical changes of the blood in the capillaries of the lungs and system, and the *connection* of respiration with calorification:

"1. The lungs perform an excretal office, on which life constantly depends, because directly and indirectly aiding calorification.

"2. The substance thrown off is hydrate of carbon.

"3. The carbon, on coming in contact with atmospheric oxygen, combines with it, forming carbonic acid gas, which is thrown off from the lungs and skin by expiration and perspiration.

"4. The amount of latent heat of the oxygen gas employed, is much greater than that of the carbonic acid gas formed in the lungs, and hence, caloric is set free, imparting heat to the blood and surface.

"5. This free heat also combines with the water of the hydrate of carbon, and converts it into vapour.

"6. The lungs and cutaneous surface aid in *regulating animal temperature* by the conversion of water into vapour, thus conveying off any excess of free caloric in the system by combining with it in the form of latent heat.

"7. The water of the hydrate of carbon is converted into vapour in the lungs and upon the surface, precisely as when wood is burned, and hence assumes the form of insensible respiratory and perspiratory transpiration.

"8. Facts appear to show that the chemical change in both venous and arterial blood may occur, independent of the vital principles, by applying to the venous, oxygen gas, and to the arterial, carbonic acid gas.

"9. The systemic red capillaries are the antagonists of the pulmonary, and are constantly decomposing carbonic acid, and with water forming hydrate of carbon; or, in other words, carbonizing the blood.

"10. From this union, water and carbonic acid are transformed into a solid substance, and hence, latent, becomes free heat, at every point where red blood circulates.

"11. The functions of the systemic red capillaries of the body in *decomposing*, and that of the small vessels of the lungs and skin in *recomposing* carbonic acid gas, reciprocally depend upon, and *balance* each other; in other words, one set *carbonizes*, the other *decarbonizes* the blood.

"12. In consequence of the indissoluble link which connects the functions of respiration and calorification, the degree of temperature, the carbonic acid evolved, and the size of the lungs as compared with the bodies of animals, always bear a direct ratio to each other.

"13. There is a beautiful analogy between animals and vegetables, in the decomposition of carbonic acid by the minute vessels of each.

"14. This explanation shows that the great end and function of respiration is, both *directly* and *indirectly*, to aid in the all-important office of the generation and diffusion of animal heat."

The theory of respiration adopted by Dr. Spencer differs, as he remarks, essentially from that of Lavoisier, Laplace and Prout, which supposes carbon and hydrogen, or hydro-carbon, to exist in the blood, and that both become oxidized by respiration. "Hydro-carbon is a mere imaginary compound, which was necessary to complete their theory, while hydrate of carbon, as the author has shown, is an extensive triple compound."

According to Dr. Spencer, "the lungs are not only employed in the functions of *excretion* and *calorification*, in expelling and oxidizing the carbon of the hydrate of carbon, but are the last of the organs of *hæmatosis*, viz:

"1. In decarbonizing the chylous and other constituents of blood, thus fitting them for nutrition.

"2. This decarbonization of the elements originally entering the animal as food, furnishes the carbon of carbonic acid, and the hydrate of carbon employed in the function of calorification.

"3. That the oxides of iron are the first instruments for oxidizing and deoxidizing carbon as the important agent in calorification, while atmospheric oxygen is the last agent.

"4. The protoxide of iron is the carrier of the carbonic acid from the lungs to the systemic capillaries.

"5. The affinities of the iron in its circle for calorification show, that if either oxide exists as a constituent of blood, the other oxide must necessarily be formed; the *pulmonic* and *systemic* capillaries antagonizing and balancing each other, in oxidizing and deoxidizing these compounds.

"6. The iron of the blood is originally derived from vegetables in the form of oxide of iron.

"7. This oxide of iron is converted into perchloride of iron by the muriatic acid of the gastric juice, and thus rendered soluble.

"8. The perchloride of iron is reconverted, in the lungs, into the hydrated peroxide of iron by the free soda of the blood.

"9. The hydrated peroxide is converted into the protoxide in the lungs, by oxidizing the carbon of the nutritious fluids.

"10. The protoxide carries carbonic acid thus formed to the systemic capillaries for calorification, and is there reconverted into hydrated peroxide.

"11. In the series of chemical compositions and decompositions of iron and carbon as explained, an exact balance is preserved in the amount of each at all points of the organism, where employed for calorification.

"12. The oxides of iron are, *probably*, employed in *oxidizing* and *deoxidizing* various other compounds than those already considered.

"13. In deoxidizing sugar, &c., to form animal fat, and in oxidizing the carbon of the fat for calorification."

The foregoing propositions present a general view of the doctrines of our author in relation to respiration and calorification; they press themselves upon the attention of the physiologist by their simplicity and apparent strict accordance with numerous well established facts in relation to the chemical constitution of the components of the animal organism, and demand a cautious and candid examination on the part of all who have the time and talents required to test their accuracy. If, as the author very candidly remarks, every step of his inquiry shall be found to be fortified by ascertained facts, and his deductions to have been legitimately drawn, he has succeeded in pointing out and determining "a circle of vital affinities, uniting all the structures and functions of the organism, and making each set of capillaries mutually dependent on, and balanced by others, in the chemico-vital changes produced in their passing currents of blood." "That such a series exists," he adds, "and that the links in the chain may be demonstrated, cannot be doubted; but in view of the intricacy of the subject, and of my limited knowledge of experimental chemistry, a due distrust is still felt in the accuracy of the attempted determination."

Besides the main subjects referred to in the summary we have given of Dr. Spencer's lectures, they contain a number of interesting suggestions on many interesting questions connected with the physiology of assimilation and nutrition.

D. F. C.

Art. XVII.—*Summary of the Transactions of the College of Physicians of Philadelphia*, from November, 1844, to March, 1845: 8vo. pp. 70.

The publication before us embraces a summary of the Transactions of the Philadelphia College of Physicians for five months, and contains a very considerable amount of interesting matter. It comprises the annual reports on surgery, on meteorology and epidemics, and on the diseases of children, besides several instructive cases communicated to the college, and a well drawn up biographical memoir of the late Dr. J. C. Otto.

The annual report on surgery by Dr. Parrish, though not presenting, as might be expected, a summary of the improvements in surgery during the preceding year, still furnishes some exceedingly interesting information. The chief topic of the report is the subject of the accidents resulting from the riots in Kensington and Southwark, in May and June of last year.

Fourteen of the cases wounded in the above riots were admitted into the Pennsylvania Hospital; and the following table furnished by Dr. Logan gives some interesting details respecting these cases.